Extended GL and Japanese Postposition *No*

Sumiyo Nishiguchi

Center for International Cooperation in Engineering Education
The University of Tokushima
2-1 Minami-josanjima, Tokushima-city, Tokushima 770-8506, Japan
nishiguchi@cicee.tokushima-u.ac.jp

Abstract. This paper proposes elaboration of the Generative Lexicon (GL) in Pustejovsky (1995) and the Extended Generative Lexicon theory (Lenci et al., 2000). My proposal is based on the Japanese genitive postposition *no*[1]. The Japanese NP_1-*no* NP_2 "NP_1-GEN NP_2" construction expresses a wider range of relations between two entities than the English possessive NP_1*'s* NP_2, such that neither selective binding (Pustejovsky, 1995) nor type-shifting based on qualia roles in NP_2 (Vikner and Jensen, 2002) captures the necessary relations—time, location, manner, and others of temporary nature. The disambiguation of possessive relations requires that lexical entries be augmented by incorporating a Referential Module comprising subcategories such as LOCATION, TIME, and MANNER.

Keywords: Generative Lexicon, Referential Module, possessive relation, Japanese genitive marker, selective binding

1 Inherent Problems with Selective Binding

GL proposed in Pustejovsky (1995) encodes four qualia roles which originate in Aristotle's concept of matters and represent four inherent properties. CONSTITUTIVE quale represents part-whole relation, FORMAL role indicates shape, ontological category, and so forth, TELIC role represents purpose and AGENTIVE role expresses origin.

Pustejovsky (1995) further suggests *selective binding* when computing the meaning of the noun phrases modified by non-intersective adjectives. For example, *fast* in *a fast typist* does not denote a typist who is also generally fast apart from typing, but specifically a typist who is fast at typing. In other words, *fast* does not modify the typist himself, but it does modify the way that the typist types, i.e., *fast* modifies the event argument of the TELIC (purpose) quale of the noun *typist*—to type.

(1) $[\![fast\_typist]\!]$ = λx[typist(x) $\wedge$ ...[TELIC = λe[type(e) $\wedge$ agent(e) = x $\wedge$ fast(e)]]...]

Selective binding works for some of the prenominal possessive modification in Japanese when NP_1-*no* phrases modify one of the qualia of NP_2, that is, selectively bind an event contained in the quale. However, I will show that there are many examples in which selective binding does not apply.

1.1 Problems with Selective Binding: Modification of Non-inherent Property

When possessive nominals represent temporary or changeable features of possessee nominals, there is no selective binding of any inherent qualia. For example, the following patterns cannot be accounted for within the existing framework.

[1] I consider the Japanese -*no* to be a postposition following Gunji (1987) and others.

(2) **TIME** yugata-no koen
evening-GEN park
"an evening park"

LOCATION Tokyo-no shinseki
Tokyo-GEN relative
"a relative in Tokyo"

chikaku-no koen
neighborhood-GEN park
"a nearby park"

ACCOMPANIMENT boshi-no fujin
hat-GEN lady
"the lady with a hat"

PROPERTY jutai-no Shakuruton[2]
seriously ill-GEN Shackleton
"seriously ill Shackleton"

1.1.1 Time When possessive modification is temporary in nature or "stage-level" (Carlson, 1977), there is no selective binding of any inherent qualia. A temporal genitive phrase such as *yugata-no* "evening's/in the evening" does not modify any of the AGENTIVE or TELIC role because *yugata-no koen* "a park in the evening" does not imply a park built in the evening nor does it imply one built solely for playing in the evenings. It rather refers to the appearance of a park in the evenings. For example, walking an evening park implies walking the park in the evenings.

(3) Yugata-no koen-o sanposhi-ta.
evening-GEN park-ACC walk-PAST
"I walked in a park in the evening."

(4) $[\![evening_park]\!] \neq \lambda$x[park(x) $\wedge$ [TELIC = λe[recreational_activity(e) $\wedge$ time(e) = evening]]...]

1.1.2 Location We shall consider an example *chikaku-no koen* "a nearby park." The locative genitive phrase *chikaku-no* "nearby" does not modify the AGENTIVE (origin) role of the *park*, which would mean that the park was created in a nearby location. *Chikaku-no* modifies something non-inherent to the noun, for *the nearby park* might not have been in the speaker's neighborhood when it was made; it might be presently located in the neighborhood. The speaker might have recently moved to the nearby location.

(5) $[\![nearby_park]\!] \neq \lambda$x[AGENTIVE = λe[make_act(e) $\wedge$ theme(e) = x $\wedge$ location(e) = neighborhood]]...]

Similarly, *Tokyo-no shinseki* "a relative in Tokyo" need not imply that the relative was born in Tokyo; it probably implies he currently resides in Tokyo. Therefore, the AGENTIVE role modification is not relevant. It is also possible to meet a relative living in Tokyo (*Tokyo-no shinseki*) in Rome, which indicates that what matters is the recent general location of the referent.

(6) Tokyo-no shinseki-to Roma-de atta.
Tokyo-GEN relative-with Rome-LOC met
"I met a relative from Tokyo in Rome."

[2] BCCWJ (2008)

1.1.3 Outstanding Property If azaleas are the outstanding features of the park, *tsutsuji-no* "with azaleas" modifies the present state of the park; however, it does not necessarily modify the AGENTIVE role of the park since the azaleas could have been planted only recently.

(7) tsutsuji-no koen
azalea-GEN park
"a park with azaleas"

(8) $[\![park_with_azaleas]\!] \neq \lambda$x[park(x) $\wedge$ [AGENTIVE = λe[make_act(e) $\wedge$ theme(e) = x $\wedge$ manner(e) = with_azaleas]]...]

In this regard, the selective binding of qualia roles cannot explain possessive modification.

1.2 Successful Application of Selective Binding: Modification of Inherent Property

Although selective binding does not apply to many possessives, it successfully applies to many others. The following sections indicate that modifications of inherent properties can be properly explained by selective binding.

1.2.1 TELIC Quale Modification: Time When NP_1-*no* phrases are temporal modifiers of inherent nature, the selective binding works. For example in *7-ji-no nyusu* "7 o'clock news," the purpose, or the TELIC role, of *news* is to describe current events or information; therefore, *7-ji-no* "7 o'clock's" modifies the TELIC role of *nyusu* "news" such that the TELIC role of the *7-ji-no nyusu* "7 o'clock news" is to describe the events taking place at 7 o'clock.

(9) 7-ji-no nyusu
7 o'clock-GEN news
"7 o'clock news"

(10) $[\![7\_o'clock\_news]\!]$ = λx[news(x) $\wedge$ [TELIC = λe[describe(e) $\wedge$ time(e) = at_seven]]...]

$$\begin{bmatrix} \textbf{7-JI-NO NYUSU "7 O'CLOCK NEWS"} & \\ \text{TYPESTR} = & \left[\text{ARG1} = \boxed{x}\text{MEDIA\_INFORMATION}\right] \\ \text{EVENTSTR} = & \left[\text{E1} = \boxed{e1}\text{PROCESS}\right] \\ \text{ARGSTR} = & \left[\text{D-ARG1} = \boxed{y}\text{INFO}\right] \\ \text{QUALIA} = & \left[\text{TELIC} = \text{DESCRIBE}\left(\boxed{e1}, \boxed{x}, \boxed{y}\right) \wedge \text{TIME}\left(\boxed{e1}\right) = \text{AT\_SEVEN}\right] \end{bmatrix}$$

1.2.2 TELIC Quale Modification: Trade and Activity Genitive phrases that represent trade and activity of the referent of NP_2 in Table 1 at the end of this article are considered to be modifiers of the TELIC role of the NP_2. Trade is regarded to play the TELIC role.

(11) biiru-no machi Munhen
beer-GEN town Munich
"the city of beer Munich"

$$\begin{bmatrix} \textbf{MACHI "TOWN"} & \\ \text{TYPESTR} = & \left[\text{ARG1} = \boxed{x}\text{LOCATION}\right] \\ \text{ARGSTR} = & \begin{bmatrix} \text{D-ARG1} = \boxed{y}\text{HUMAN} \\ \text{D-ARG3} = \boxed{z}\text{PHYS\_OBJ} \\ \text{D-E1} = \boxed{e1}\text{STATE} \\ \text{D-E2} = \boxed{e2}\text{PROCESS} \end{bmatrix} \\ \text{QUALIA} = & \begin{bmatrix} \text{FORMAL} = \text{LIVE}\left(\boxed{e1}, \boxed{y}, \boxed{x}\right) \\ \text{TELIC} = \text{MAKE\_ACT}\left(\boxed{e2}, \boxed{y}, \boxed{z}\right) \end{bmatrix} \end{bmatrix}$$

(12) $[\![city\_of\_beer]\!]$ = λx[town(x) ∧ [TELIC = λe[make_act(e) ∧ theme(e) = ϵz.beer]]...]

Similarly, if Coach is a bag store, the TELIC role of Coach lies in the act of selling, and bags are the theme of the selling event.

(13) *kaban-no Kochi* "Bags Coach"

(14) $[\![bags\_Coach]\!]$ = λx[store(x) ∧ [TELIC = λe[sell_act(e) ∧ theme(e) = ϵz.bag]]...]

1.2.3 Agentive Role Modification: Location *Osuro kogai-no mura* "a village in the suburb of Oslo"[3]can be analyzed in a similar manner. Here, a village in the suburb of Oslo implies a village created in the location in the suburb in Oslo.

(15) $[\![village\_in\_the\_suburb\_of\_Oslo]\!]$ = λx[village(x) ∧ [AGENTIVE = λe[make_act(e) ∧ location(e) = Oslo-suburb]]...]

1.3 Extended Qualia in SIMPLE

As an extended GL, SIMPLE (Lenci et al., 2000) contains more ontological information, more argument structure and terminology than GL, and has the scope of application to language engineering. The extended qualia structure consists of the same four qualia roles as those in GL, namely, AGENTIVE, TELIC, CONSTITUTIVE and FORMAL roles, which may also have their subcategories that did not exist in GL.

An innovative feature of SIMPLE is that it provides language neutral templates for lexicons. For example, in any language, anything that belongs to a category of instruments is assigned the same template.

However, even with an extended qualia structure, SIMPLE fails to account for the complete range of meaning of possessive construction. Even though it provides more ontological information and more detailed qualia roles than the original GL, time, location, and other properties are not part of the lexical information in SIMPLE so that possessives are not allowed to modify these properties of NP_2.

2 Problems with Type-shifting Possessee Noun by Qualia

In formal semantics, Pustevjosky's qualia structure has been applied for deriving possessive relations by means of the type-shifting mechanism. Instead of selective binding, Vikner and Jensen (2002) type-shift the possessor noun using one of the qualia roles to explain the meaning of the genitive phrases following Partee (1997). This section overviews their theories and demonstrates that even these methods do not sufficiently explain the Japanese possessives.

2.1 Partee (1997)

Possessive relations are ambiguous in both English and Japanese. For example, there is more than one interpretation for *John's book*. It may refer to the book that *John* owns or the book that *John* wrote (Barker, 1995, 87).

In view of such ambiguity, Partee (1997) assumes two syntactic types for *John's* depending on whether or not the following noun is inherently relational. If the following noun is a non-relational common noun (CN) such as *car*, *John's* composes with *car* which is a regular (e, t) type predicate, namely, a function from individuals to truth-values (Montague, 1973), and the relation between *John* and *car* is contextually supplied (16a). On the contrary, when *John* is followed by inherently relational nouns such as *brother*, *employee* and *enemy*, which are $(e, (e, t))$ type with an extra argument slot (a function from individuals to another function from individuals to truth-values), the relation between John and his brother in *John's brother* inherits kinship from the two-place predicate *brother*.

[3] BCCWJ (2008)

(16) a. Free R type:
Syntax: [John's]$_{NP/CN}$
Semantics: λQλP[john(λz[$\exists$x[$\forall$y[[Q(y) $\wedge$ R(y)(z)] $\leftrightarrow$ y = x] $\wedge$ P(x)]])]

b. Inherent relation type:
Syntax: [John's]$_{NP/TCN}$ (TCN: transitive common noun)
Semantics: λRλP[john(λz[$\exists$x[$\forall$ y[R(z)(y) $\leftrightarrow$ y = x] $\wedge$ P(x)]])]

If we apply Partee's theory to Japanese examples, most of the possessive relations with non-relational nouns are unpredictable, and the contextually supplied relation R remains largely ambiguous.

2.2 Vikner and Jensen (2002)

In order to reduce the cost of pragmatics, Vikner and Jensen (2002) apply the qualia structure (Pustejovsky, 1995) of the possessee noun and type-shift even a non-inherently relational *NP*$_2$ into a relational noun. For example, even though *poem* is not a relational noun, *John's poem* can be interpreted as the *poem* that John composed because the internal semantic structure of *poem* contains an author-of relation as AGENTIVE role. The meaning shifting operator Q$_A$ raises a one-place holder *poem* into a two-place holder. The type-shifted *NP*$_2$ can now combine with the possessive NP, which has a uniform type $((e,(e,t)),((e,t),t))$—a function from a two-place predicate to a generalized quantifier type—so that the authorship relation is inherited from *NP*$_2$ *poem*, and R is no longer a free variable.

(17) Q$_A$(poem) = $\lambda x \lambda y[poem'(x) \wedge compose'(x)(y)]$

However, even Vikner and Jensen (2002)'s method is not sufficient to systematically compute the meaning of the Japanese *NP*$_1$*-no NP*$_2$ "NP$_1$-GEN NP$_2$" construction. For example, in terms of location (III) in Tables 1 and 2, the relation between *Tokyo* and *shinseki* "relative" in *Tokyo-no shinseki* "a relative in Tokyo" is location which is not part of the qualia structure of *relative*. We also encounter a problem with *boshi-no fujin* "the lady with a hat." Since wearing a hat is not part of the qualia roles of the non-inherently relational noun *fujin*"lady," even Vikner and Jensen's system is unable to supply the binder for R.

3 Extended GL: Extensional Module Modification

3.1 A Referential Module

As explained in the previous sections, non-inherent properties cannot modify any inherent qualia or extended qualia roles in *NP*$_2$ so that neither selective binding nor type-shifting mechanism can apply. Even though many of the Japanese postpositional phrases selectively bind one of the qualia of the possessee nominals, we need to account for other cases that cannot be explained by existing qualia modification.

As Kikuchi and Sirai (2002, 2006) admit, the spatio-temporal location is the semantic content of a large number of Japanese possessive phrases.[4]

[4] Kikuchi and Sirai (2002, 2006) classify the semantic patterns of *NP*$_1$*-no NP*$_2$ construction into three categories in accordance with how the free relation variable *R* between the two entities represented by *NP*$_1$ and *NP*$_2$ is derived.

a *NP*$_1$ largely determines the relation: *NP*$_1$ is either a spatio-temporal location, which modifies *NP*$_2$, or a person/institution to whom the referent of *NP*$_2$ belongs (e.g., *pari-no ie* "a house in Paris") and the possessive interpretation belongs (e.g., *Sheikusupia-no hon* "Shakespeare's book").

b *NP*$_2$ mainly determines the relation: If *NP*$_2$ refers to an event, a relation, or a function, then the referent of *NP*$_1$ functions as its argument. If *NP*$_2$ refers to an object, then its qualia structure (Pustejovsky, 1995) determines the relation between *NP*$_1$ and *NP*$_2$ (e.g., *Naomi-no haha* "Naomi's mother," *machi-no hakai* "the destruction of the city," and *Toyota-no* kuruma "Toyota's car").

c Neither *NP*$_1$ nor *NP*$_2$ determines the relation. In some cases, *R* is contextually determined.

In order to accommodate noun modification by postpositional phrases that denote temporary location, time, accompaniment, and property, I propose that additional information be encoded into the lexicon, specifically, a referential module be added to GL:

(18) **A Referential Module**:

TIME = AT
LOCATION = IN
MANNER = WITH
INSTRUMENT = WITH

In harmony with the present analysis, Enç (1987) discusses the temporal ambiguity of nouns such as *president*, *bird* and *brain*. For example, *the president* in (19) may refer to (i) the current president at time of utterance who acted foolishly when he was not president, or (ii) then president who is no more president at speech time.

(19) The president was a fool.

Musan (1999) also assumes that all noun phrases have a time argument. For example, in (20) below, the person referred to as the intern could have been a hard-working intern in the past or at present—the present intern who was a hard-working person when he was not an intern yet. In other words, the time argument of *the intern* can refer to the past time or the utterance time.

(20) The intern worked hard.

Moreover, according to Sowa (1999), all physical objects usually occupy some space and time. Therefore, we incorporate location and time as subcategories of the referential module.

The following sections demonstrate how the extended GL renders the genitive modification underivable from the previous qualia structure.

3.2 Locative Modification

The lexical input for *shinseki* "relative" in GL should not allow modification by a locative genitive phrase *Tokyo-no* "in Tokyo" under the existing GL, since *Tokyo-no* "in Tokyo" would not modify any inherent qualia roles.

(21) Tokyo-no shinseki
Tokyo-GEN relative
"a relative in Tokyo"

GL:

$$\begin{bmatrix} \textbf{SHINSEKI "RELATIVE"} & \\ \text{TYPESTR} = & \begin{bmatrix} \text{ARG1} = \boxed{x}\,\text{RELATIVE} \end{bmatrix} \\ \text{EVENTSTR} = & \begin{bmatrix} \text{E1} = \boxed{e1}\,\text{STATE} \\ \text{E2} = \boxed{e2}\,\text{PROCESS} \end{bmatrix} \\ \text{ARGSTR} = & \begin{bmatrix} \text{ARG1} = \boxed{y}\,\text{HUMAN} \\ \text{D-ARG1} = \boxed{z}\,\text{HUMAN} \end{bmatrix} \\ \text{QUALIA} = & \begin{bmatrix} \text{FORMAL} = \text{KINSHIP\_RELATION}\left(\boxed{e1}, \boxed{x}, \boxed{y}\right) \\ \text{AGENTIVE} = \text{KINSHIP\_RELATION}\left(\boxed{e2}, \boxed{z}, \boxed{x}\right) \end{bmatrix} \end{bmatrix}$$

Therefore, we incorporate location as part of the referential or extensional module (EXT) such that the location of a relative can be modified by the locative postpositional phrase as in (22).

Extended GL:

$$\begin{bmatrix}\textbf{SHINSEKI "RELATIVE"} & \\ \text{TYPESTR} = & \left[\text{ARG1} = \boxed{x}\text{RELATIVE}\right] \\ \text{EVENTSTR} = & \begin{bmatrix}\text{E1} = \boxed{e1}\text{STATE} \\ \text{E2} = \boxed{e2}\text{PROCESS} \\ \text{E3} = \boxed{e3}\text{STATE}\end{bmatrix} \\ \text{ARGSTR} = & \begin{bmatrix}\text{D-ARG1} = \boxed{y}\text{HUMAN} \\ \text{D-ARG2} = \boxed{z}\text{HUMAN} \\ \text{D-ARG3} = \boxed{l}\text{LOCATION}\end{bmatrix} \\ \text{QUALIA} = & \begin{bmatrix}\text{FORMAL} = \text{KINSHIP\_RELATION}\left(\boxed{e1},\boxed{x},\boxed{y}\right) \\ \text{AGENTIVE} = \text{KINSHIP\_RELATION}\left(\boxed{e2},\boxed{x},\boxed{z}\right)\end{bmatrix} \\ \text{EXT} = & \left[\text{LOC} = \text{AT}\left(\boxed{e3},\boxed{x},\boxed{l}\right)\right]\end{bmatrix}$$

$$\begin{bmatrix}\textbf{TOKYO-NO SHINSEKI "TOKYO RELATIVE"} & \\ \text{TYPESTR} = & \left[\text{ARG1} = \boxed{x}\text{RELATIVE}\right] \\ \text{EVENTSTR} = & \begin{bmatrix}\text{E1} = \boxed{e1}\text{STATE} \\ \text{E2} = \boxed{e2}\text{PROCESS} \\ \text{E3} = \boxed{e3}\text{STATE}\end{bmatrix} \\ \text{ARGSTR} = & \begin{bmatrix}\text{D-ARG1} = \boxed{y}\text{HUMAN} \\ \text{D-ARG2} = \boxed{z}\text{HUMAN} \\ \text{D-ARG3} = \boxed{l}\text{LOCATION}\end{bmatrix} \\ \text{QUALIA} = & \begin{bmatrix}\text{FORMAL} = \text{KINSHIP\_RELATION}\left(\boxed{e1},\boxed{x},\boxed{y}\right) \\ \text{AGENTIVE} = \text{KINSHIP\_RELATION}\left(\boxed{e2},\boxed{x},\boxed{z}\right)\end{bmatrix} \\ \text{EXT} = & \left[\text{LOC} = \text{AT}\left(\boxed{e3},\boxed{x},\boxed{l}\right) \wedge \text{LOC}\left(\boxed{e3}\right) = \text{TOKYO}\right]\end{bmatrix}$$

(22) $[\![relative\_in\_Tokyo]\!]$ = λx[relative(y)(x) ∧...[EXT = λe[LOC(e)=Tokyo]]...]

3.3 Temporal Modification

The temporal genitive phrase such as *yugata-no* "evening's" does not modify any of the AGENTIVE or TELIC roles. Rather, it refers to the appearance of a park during an evening visit; *yugata-no* "evening's" locates the referent of the park into certain time period. In other words, *evening's* modifies the referential content of the park in the extended GL.

$$\begin{bmatrix}\textbf{YUGATA-NO KOEN "A PARK IN THE EVENING"} & \\ \text{TYPESTR} = & \text{ARG1} = \boxed{x}\ \text{outdoor's\_location} \\ \text{ARGSTR} = & \begin{bmatrix}\text{D-ARG1} = \boxed{w}\text{HUMAN} \\ \text{D-ARG2} = \boxed{z}\text{HUMAN} \\ \text{D-ARG3} = \boxed{l}\text{LOCATION} \\ \text{D-E1} = \boxed{e1}\text{TRANSITION} \\ \text{D-E2} = \boxed{e2}\text{STATE} \\ \text{D-E3} = \boxed{e3}\text{PROCESS}\end{bmatrix} \\ \text{QUALIA} = & \begin{bmatrix}\text{CONSTITUTIVE} = \left\{\text{LAWN, BENCH, FOUNTAIN,...}\right\} \\ \text{FORMAL} = \boxed{x} \\ \text{TELIC} = \text{RECREATIONAL\_ACTIVITY}\left(\boxed{e3},\boxed{w},\boxed{x}\right) \\ \text{AGENTIVE} = \text{MAKE\_ACT}\left(\boxed{e1},\boxed{z},\boxed{x}\right)\end{bmatrix} \\ \text{EXT} = & \begin{bmatrix}\text{LOC} = \text{IN}\left(\boxed{e2},\boxed{x},\boxed{l}\right) \\ \text{TIME} = \text{AT}\left(\boxed{e2},\boxed{x},\boxed{t}\right) \wedge \text{TIME}\left(\boxed{e2}\right) = \text{EVENING}\end{bmatrix}\end{bmatrix}$$

(23) $[\![park\_in\_the\_evening]\!]$ = λx[park(x) ∧ [EXT = λe[being-park(e) ∧ time(e) = evening]]...]

3.4 Accompaniment and Property by Manner

Carrying a hat or a bag is a temporary activity, that does not modify any inherent qualia roles. It does, however, modify the manner role in the EXT structure as shown below.

(24) boshi-no hito
hat-GEN person
"the person with a hat"

$$\begin{bmatrix} \textbf{BOSHI-NO HITO "THE PERSON WITH A HAT"} & \\ \text{TYPESTR} = & \text{ARG1} = \boxed{x}\ \text{human} \\ \text{ARGSTR} = & \begin{bmatrix} \text{D-ARG1} = \boxed{l}\text{LOCATION} \\ \text{D-E1} = \boxed{e1}\text{STATE} \\ \text{D-E2} = \boxed{e2}\text{STATE} \end{bmatrix} \\ \text{QUALIA} = & \begin{bmatrix} \text{FORMAL} = \boxed{x} \end{bmatrix} \\ \text{EXT} = & \begin{bmatrix} \text{LOC} = \text{IN}\left(\boxed{e1}, \boxed{x}, \boxed{l}\right) \\ \text{MANNER} = \text{WITH}\left(\boxed{e1}, \boxed{x}\right) \wedge \text{MANNER}\left(\boxed{e1}\right) = \text{WITH-HAT} \end{bmatrix} \end{bmatrix}$$

(25) $[\![boshi - no\_hito]\!]$ = λx[person(x) $\wedge$ [EXT = λe[be-person(e) $\wedge$ manner(e)=with-hat]]...]

4 Computation

Regarding the compositional calculation of meaning, I assume that the ϵ operator and the ι operator lower the types of common nouns into (e). The use of the ϵ operator follows its use for Japanese nouns in Cann et al. (2005).

(26) *boshi* "hat": ϵx.hat: some x satisfying *hat(x)*, if there is one
hito "person": ιy.person(y): the unique x satisfying *person(x)*, if there is such a thing
no: λPλQ. ιy[Q(y) $\wedge$ R(ϵx.P)(y)]
boshi-no hito "the person with a hat":
ιy.[person(y) $\wedge$ manner(e) = with(ϵ.hat)(y)]

5 Application of Extended GL to English Prepositional Phrases

As originally indicated by Teramura (1980) and Makishita (1984), the meaning of the Japanese postposition *-no* varies to the extent that it cannot be translated into the English preposition *of* alone. Tables 1 and 2 demonstrate that *-no* is also translated into other prepositions, such as *in*, *at*, *for*, *from*, *about*, *with*, and also into noun compounds. They demonstrate that the Japanese genitive marker not only expresses possession as in *Naomi's bag* and inalienable relations as in *Naomi's face* but also aspects such as location, accompaniment, property, and quantity. There is even the reversal of the possessor argument between (I) and (V–VI). The possessor argument is NP_1 in (I), as in English *Naomi's bag* whose possessor argument is *Naomi*. On the contrary in (V), the possessor of the bag is NP_2 *hito* "man" and there is no English equivalent *big bag's person*. In (VI) *Kaban-no Kochi* "Bags Coach," *Coach* is a store, and therefore the possessor of a bag. The controller-controllee relation is also reversed, for example, in *Naomi-no kuruma* "Naomi's car" (type I), *Naomi* is the controller of the car, i.e., NP_2 the car is at *Naomi*'s disposal as in English *the girl's car* (Vikner and Jensen, 2002). On the contrary, in *boshi-no fujin* "the lady with a hat," NP_1 *boshi* is at the person's disposal. *Aoi-me-no ningyo* "the doll with blue eyes," literally, "blue eyes' doll" in (VIII) even expresses the part-whole relation in the reverse direction, compared with *ningyo-no me* "the doll's eyes."

As Johnston and Busa (1996) analyzed English nominal compounds in comparison with Italian prepositions by qualia modifications, the Extended GL introduced in this paper should apply to

non-inherent modification by prepositional phrases in other languages. Furthermore, the methodology presented should also apply to adjectival and prepositional modification in general, as far as such modifiers detect the presence of the event argument contained in common nouns that they modify.

6 Conclusion

Japanese genitive postpositions cannot be disambiguated in terms of the existing qualia of the possessee nominals. We need to augment the semantic content by adding another module REFERENTIAL or EXTENSIONAL structure. The present work provides an enriched lexical entry that enables access to the sense of NP_2 and determines the semantic relation expressed by Japanese genitive postpositions. Future work concerns identifying which quale should be used for the interpretation of the possessive noun phrases.

Table 1: Semantic Ambiguity of Japanese Postposition *No*

Relation	Japanese Possessive	English Possessive	English Compound	English PP
I possession	Naomi-no kaban	Naomi's bag	*Naomi bag	a bag of Naomi
II part-whole	Naomi-no kao	Naomi's face	*Naomi face	the face of Naomi
III location	Tokyo-no shinseki	*Tokyo's relative	Tokyo relative	relative in Tokyo
IV time	yugata-no koen natsu-no kyuka 7-ji-no nyusu	*evening's park *summer's vacation *7 o'clock's news	an evening park summer vacation 7 o'clock news	a park in the evening vacation in summer the news at 7 o'clock
V accompaniment	kaban-no hito boshi-no fujin	*bag's man *hat's lady	the bag man the hat lady	the man with a bag the lady with a hat
VI trade	Kaban-no Kochi	*Bags' Coach	Bags Coach	Coach for Bags
VII activity	maaruboro-no kuni biiru-no machi	*Marlboro's country *the beer's city	Marlboro country *the beer city	the country of Marlboro the city of beer
VIII outstanding property	aoi-me-no ningyo tsutsuji-no koen	*blue eyes' doll *azaleas' park	blue eyes doll *azalea park	the doll with blue eyes a park with azaleas
IX weight	1-kiro-no pasokon	*1kg's computer	a 1kg computer	*the computer of 1kg
X quantity	3-bon-no pen	*three's pen	three pens	
XI intensional property	nise-no fukahire nise-no keisatsukan	*fake's shark fin *fake's police officer	fake shark fin fake police officer	

Table 2: Data translated from *Balanced Corpus of Contemporary Written Japanese*, BCCWJ2008 edition, by The National Institute of Japanese Language

Relation	Japanese Possessive	English Possessive	English Compound	English PP
III location	Osuro kogai-no mura Hachioji-shi-no borantia guruupu	*Oslo suburb's village Hachioji city's volunteer group	*Oslo suburb village Hachioji city volunteer group	a village in the suburb of Oslo a volunteer group in Hachioji city
IV time	katsute-no ikioi manatsu-no hyozan natsu-no kaidan-jiki	*past's force summer peak's iceberg *summer's horror season	past force ?summer peak iceberg summer horror season	force in the past iceberg in the peak of summer horror season in summer
VIII outstanding property	jutai-no Shakuruton	*serious illness's Shackleton	*serious illness Shackleton	Shackleton in serious illness
X quantity	9-nin-no esukimo	*nine's Eskimos	nine Eskimos	*Eskimos of nine

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